Stoller
Hanford Office

HGLP-LDR-026

299-W15-64 (A7365)
Log Data Report

Introduction:

This document (HGLP-LDR-026) supersedes DOE-EM/GJ743-2004 issued in October 2004.

Recent logging using the Passive Neutron Logging System (PNLS) requires amending the log data report for this borehole. The results of the PNLS log do not change the interpretations of the previous SGLS logging. The new information is therefore appended to the end of the original document under the heading "Passive Neutron Log (2006)". This log data report includes two new plots and amended combination plots (w/PNLS data replacing dead-time data) replace the 2004 combination plots.

Borehole Information:

Borehole: 299-W15-64 (A7365)			**Site:** 216-Z-7 Crib		
Coordinates (WA State Plane)		**GWL (ft)[1]:** 182.6		**GWL Date:** 07/19/04	
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
135925.733 m	566739.895 m	10/47	668.69 ft	189	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	4.1	6 9/16	6	9/32	4.1	~ 200
Welded Steel	0.0	8 5/8	8	5/16	0	~ 156

Borehole Notes:

The logging engineer used a steel tape to measure the casing diameter and stickup.

Hanford Wells (Chamness and Merz 1993) indicated the borehole was drilled in 1947 to approximately 156 ft. On the basis of an historical log acquired in 1976 the borehole depth was approximately 151 ft. The borehole was apparently deepened during January 1983 to approximately 200 ft. A 6.0-in. liner was placed in the borehole to 200 ft and the annulus between the 6-in. and 8-in. casings was grouted.

Logging Equipment Information:

Logging System:	Gamma 4E		**Type:** SGLS (70%) 34TP40587A
Calibration Date:	05/04	**Calibration Reference:**	DOE-EM/GJ642-2004
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2 Repeat			
Date	07/21/04	07/21/04			
Logging Engineer	Pearson	Pearson			
Start Depth (ft)	181.0	166.0			
Finish Depth (ft)	5.0	148.0			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A[3]	N/A			
Pre-Verification	BA121CAB	BA121CAB			

Log Run	1	2 Repeat			
Start File	BA121000	BA121177			
Finish File	BA121176	BA121195			
Post-Verification	BA121CAA	BA121CAA			
Depth Return Error (in.)	- 1	- 0.5			
Comments	No fine-gain adjustment.	No fine-gain adjustment.			

Logging Operation Notes:

Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 118.

Analysis Notes:

Analyst:	Henwood	Date:	09/29/04	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the acceptance criteria. Examinations of spectra indicate that the detectors functioned normally during logging, and the spectra are accepted.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations for SGLS spectra were calculated in EXCEL (source file: G4EJul04.xls). A combined casing thickness of 0.594 in. (0.281 in. + 0.313 in.) was applied to the data above 156 ft for the 6- and 8-in. casings. Below 156 ft a casing thickness of 0.2813 in. was applied for the 6-in. casing. No dead time or water corrections were required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

A comparison plot of the Westinghouse Hanford Company Radionuclide Logging System (RLS) data acquired in 1995 with the current SGLS data is included. An historical gross gamma logging plot has been copied from Fecht et al. (1977) and digitized. This log is plotted with the current SGLS total gamma log.

Results and Interpretations:

^{137}Cs was the man-made radionuclide detected in this borehole. ^{137}Cs concentrations ranged between 0.1 and 0.5 pCi/g between 147 and 171 ft. It was also detected at a few isolated locations in the borehole near its MDL of 0.2 pCi/g.

A comparison plot of RLS data acquired in 1995 with the current SGLS data is included. The RLS data were decayed to the date of the SGLS log data. ^{137}Cs was detected at similar depth locations and concentrations as with the SGLS, suggesting stability since 1995.

A plot of an historical gross gamma log acquired in this borehole in 1976 is included (Fecht et al. 1977); the total depth of logging was approximately 151 ft. In 1976, elevated gamma activity appears to exist between 101 and 109 ft. This elevated activity is attributed to the naturally occurring KUT and not contamination. Evidence of the low concentration ^{137}Cs contamination observed in 2004 between 147 and 151 ft was not indicated by the historical total gamma log.

The ^{40}K and ^{232}Th logs show some variations in concentrations (e.g., 105 ft), suggesting lithology changes that may be correlated with adjacent boreholes.

The plots of the repeat sections indicate reasonable repeatability of concentrations and depth.

Passive Neutron Logging (2006):

Logging Equipment Information:

Logging System:	Gamma 4I	**Type:**	Passive Neutron U1754
Calibration Date:	None	**Calibration Reference:**	None
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Passive Neutron Logging System (PNLS) Log Run Information:

Log Run	1	2	3		
Date	10/05/06	10/05/06	10/05/06		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	5.0	184.0	148.0		
Finish Depth (ft)	191.0	190.0	150.0		
Count Time (sec)	60	60	60		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
Sample Interval (ft)	1.0	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	DI482CAB	DI482CAB	DI482CAB		
Start File	DI482000	DI482187	DI482194		
Finish File	DI482186	DI482193	DI482196		
Post-Verification	*	*	*		
Depth Return Error (in.)	N/A	N/A	0.0		
Comments	None	Check of anomalous counts at 187'.	Repeat section. *Instrument failure reason unknown, no post survey.		

Logging Operation Notes:

An Am-Be neutron source was used for verification measurements with the passive neutron logging system. Currently there are no verification criteria established for this system. A post-survey verification measurement was not taken.

Analysis Notes:

Analyst:	Pope	**Date:**	10/24/06	**Reference:**	GJO-HGLP 1.6.3, Rev. 0

Log files were processed in batch mode using APTEC SUPERVISOR to determine count rates. Verification spectra were used as a check that the tool is functioning properly. The count rate from the pre-survey verification measurement does indicate the tool was functioning properly at the beginning of the log.

The tool appears to have failed at approximately 187 ft. It was later concluded that water had seeped into the tool, shorting the electronics. Depth to groundwater was 182.6 ft in 1994. Therefore, all data below the 182 ft depth, and the repeat section, are rejected as possibly spurious.

Results and Interpretations:

The passive-neutron logging method has been shown to be effective in qualitatively detecting zones of alpha-emitting contaminants from secondary neutron flux generated by the (α,n) reaction and may indicate the presence of α-emitting nuclides, including transuranic radionuclides, even where no gamma emissions

are available for detection above the MDL. The passive neutron signal depends on the concentration of α sources, and also the concentrations of lighter elements such as N, O, F, Mg, Al, and Si which emit neutrons after alpha capture. This logging system cannot be calibrated and the data are qualitative only.

Passive neutron data were acquired in the borehole from the ground surface to 182 ft. The passive neutron detector indicates only a slight elevation in count rate near ground surface, which may be attributable to cosmic radiation.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

List of Plots:

Original Plots (2004):

Man-Made Radionuclides
Natural Gamma Logs
~~Combination Plot~~ (replaced 2006 – see below)
Total Gamma and Dead Time
SGLS/RLS Man-made Comparison
Historical Gross Gamma Comparison
Repeat Section for Man-Made Radionuclides
Repeat Section of Natural Gamma Logs

Passive Neutron Logging (2006):

Combination plot (amended w/PNLS data replacing dead-time data)
Passive Neutron and Total Gamma Comparison

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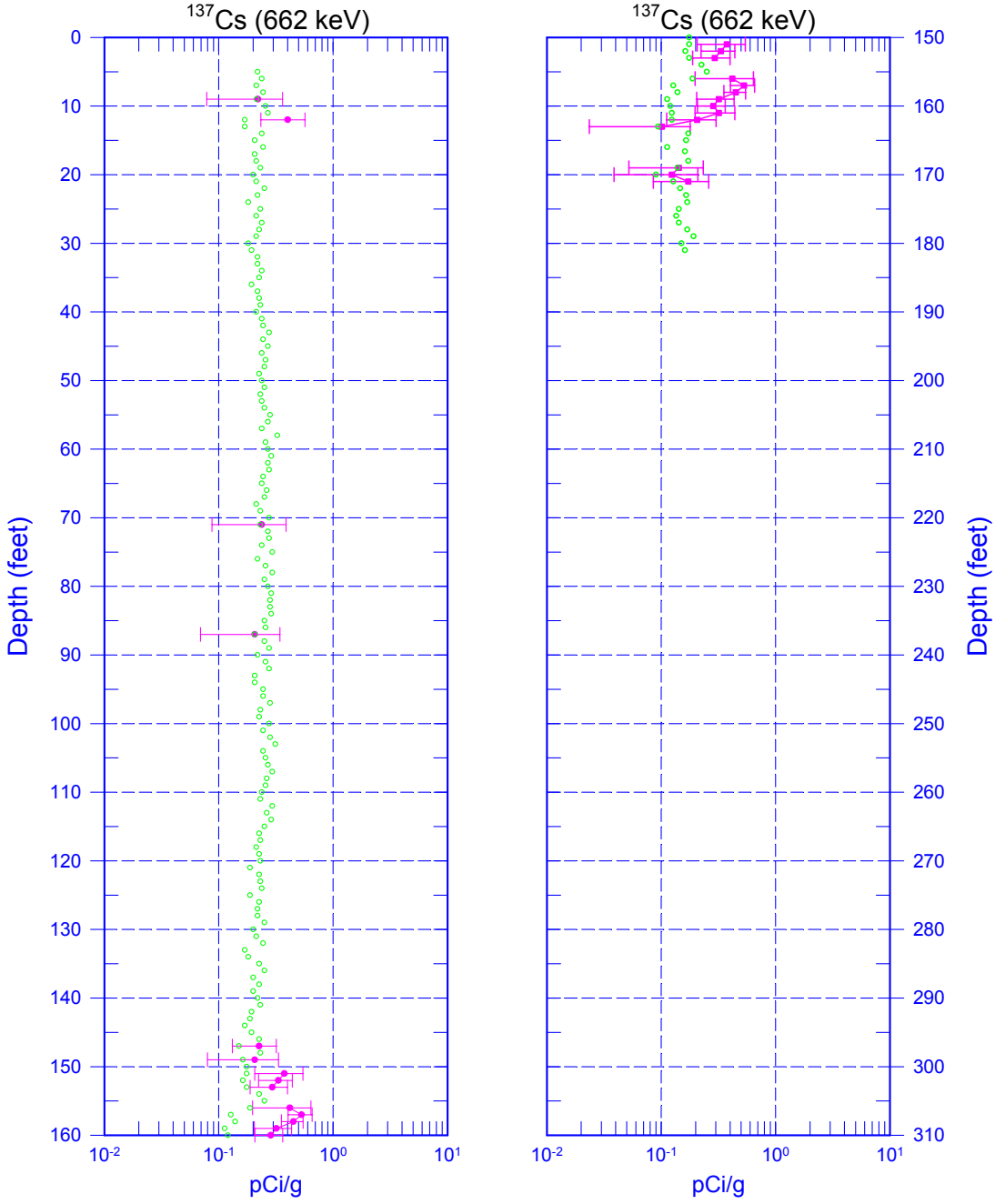
[1] GWL – groundwater level
[2] TOC – top of casing
[3] N/A – not applicable

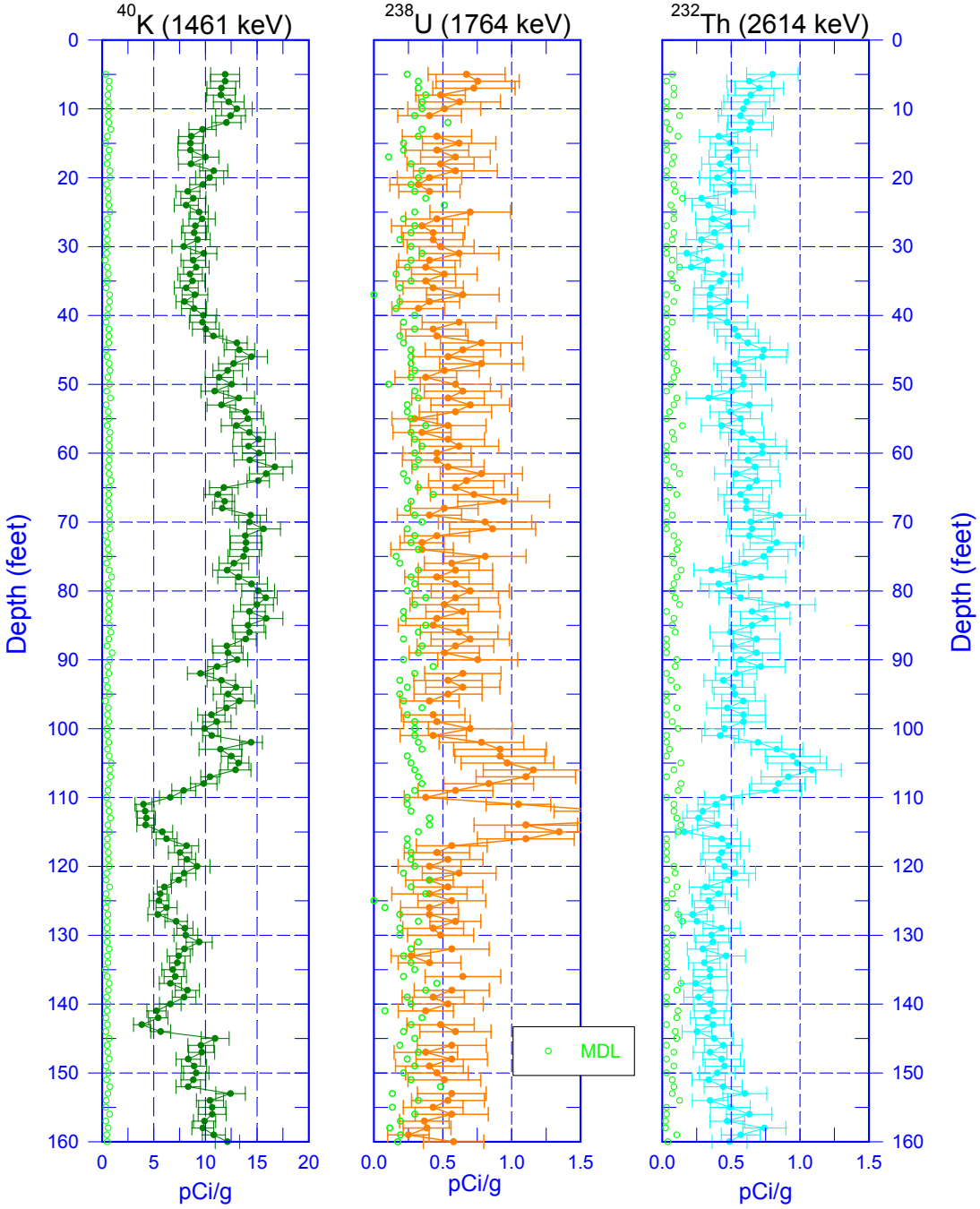
299-W15-64 (A7365)
Man-Made Radionuclides



Zero Reference = Top of Casing

Last Log Date - 07/21/04

299-W15-64 (A7365)
Natural Gamma Logs

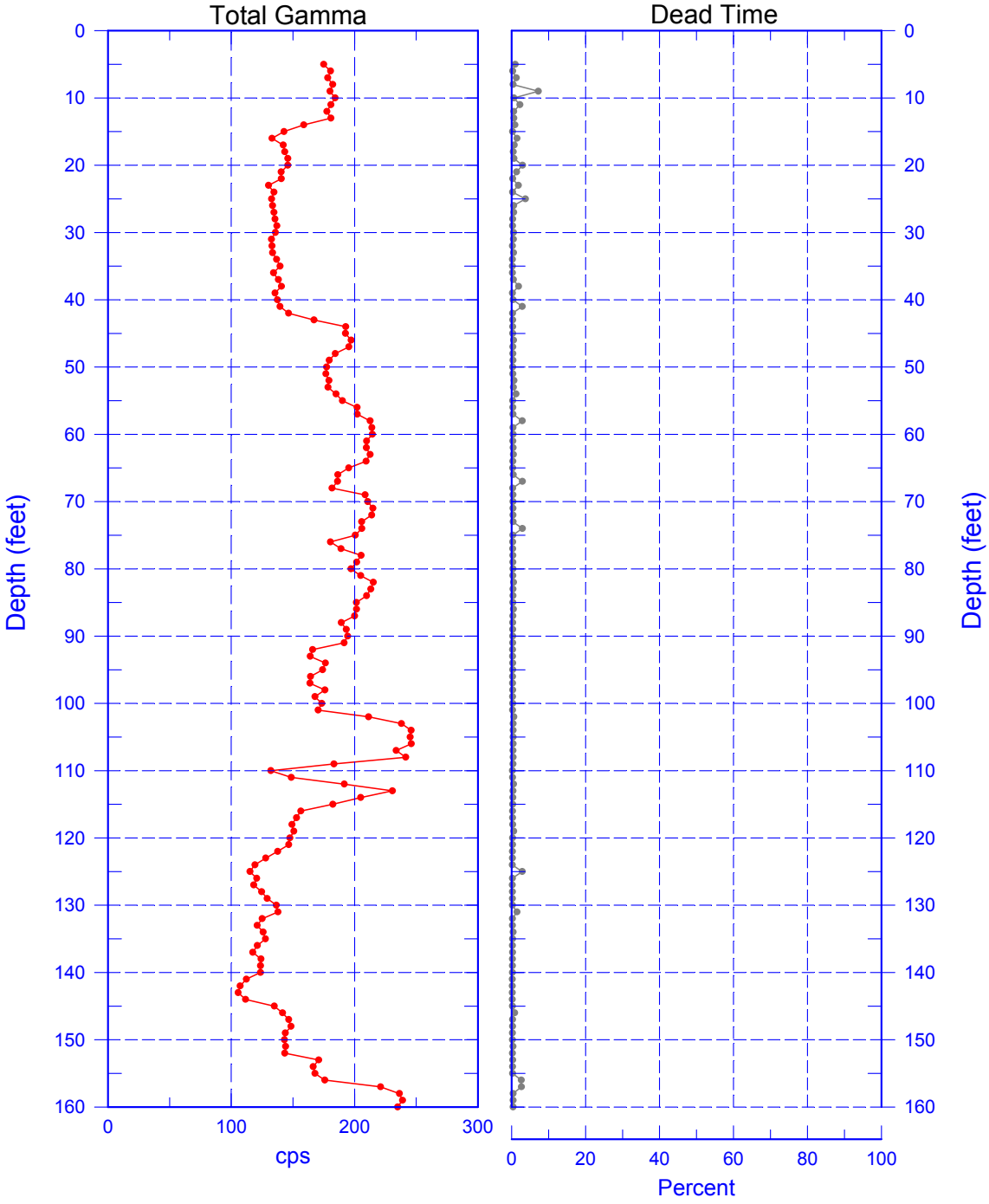


Zero Reference = Top of Casing

Last Log Date - 07/21/04

299-W15-64 (A7365)

Total Gamma & Dead Time

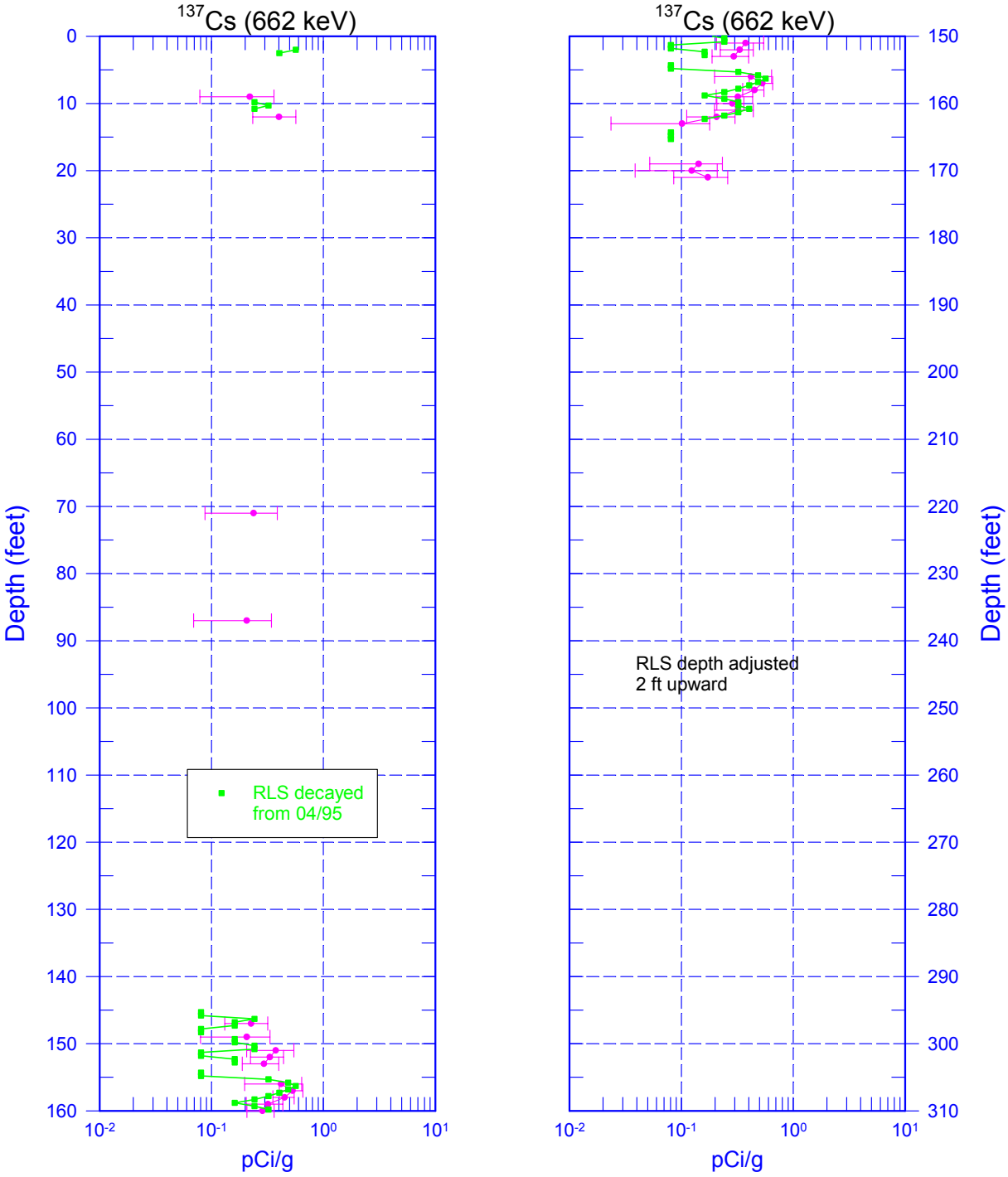


Zero Reference = Top of Casing

Last Logging Date - 07/21/04

299-W15-64 (A7365)

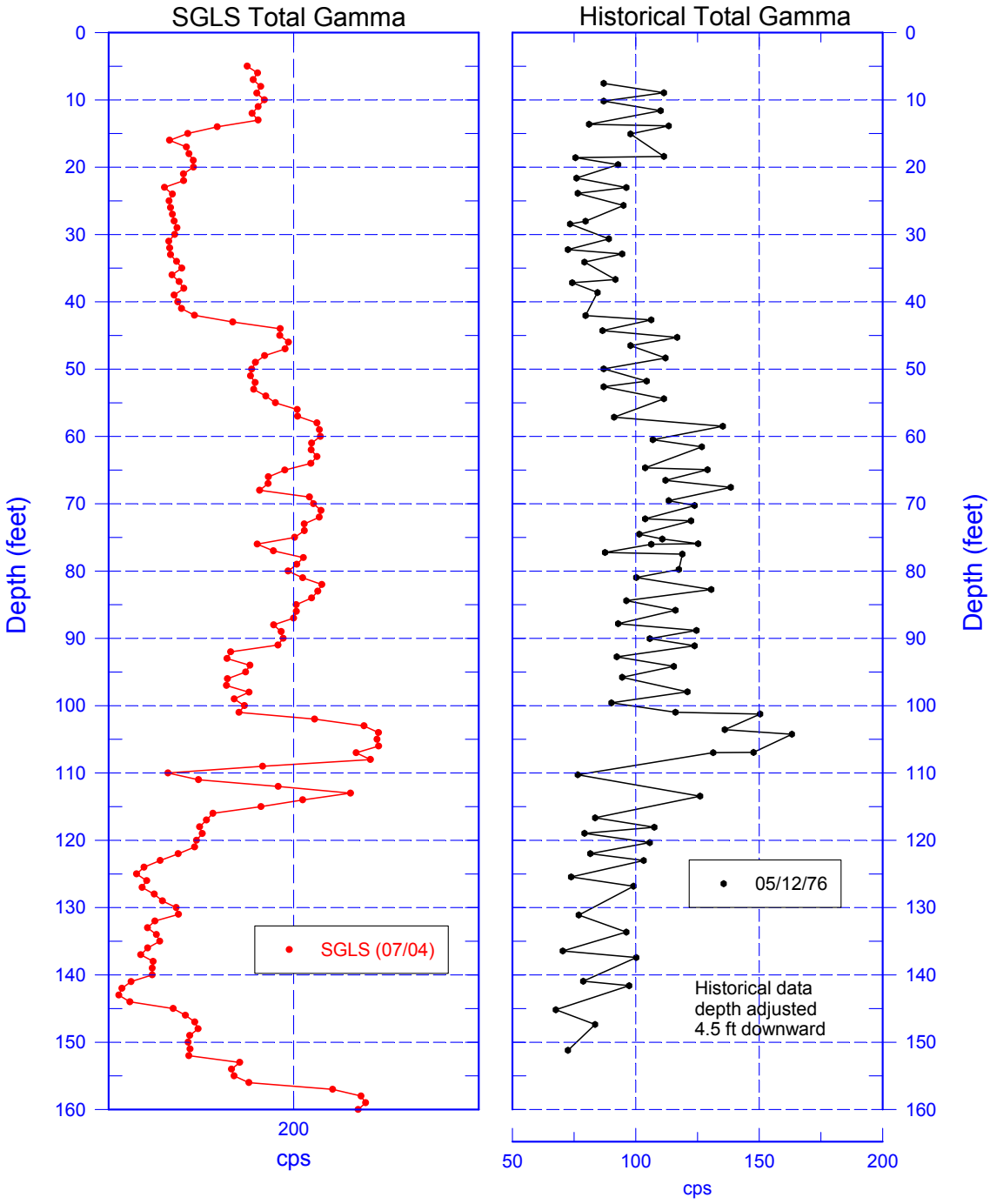
Man-Made Radionuclide Comparison



Zero Reference = Top of Casing

Last Log Date - 07/21/04

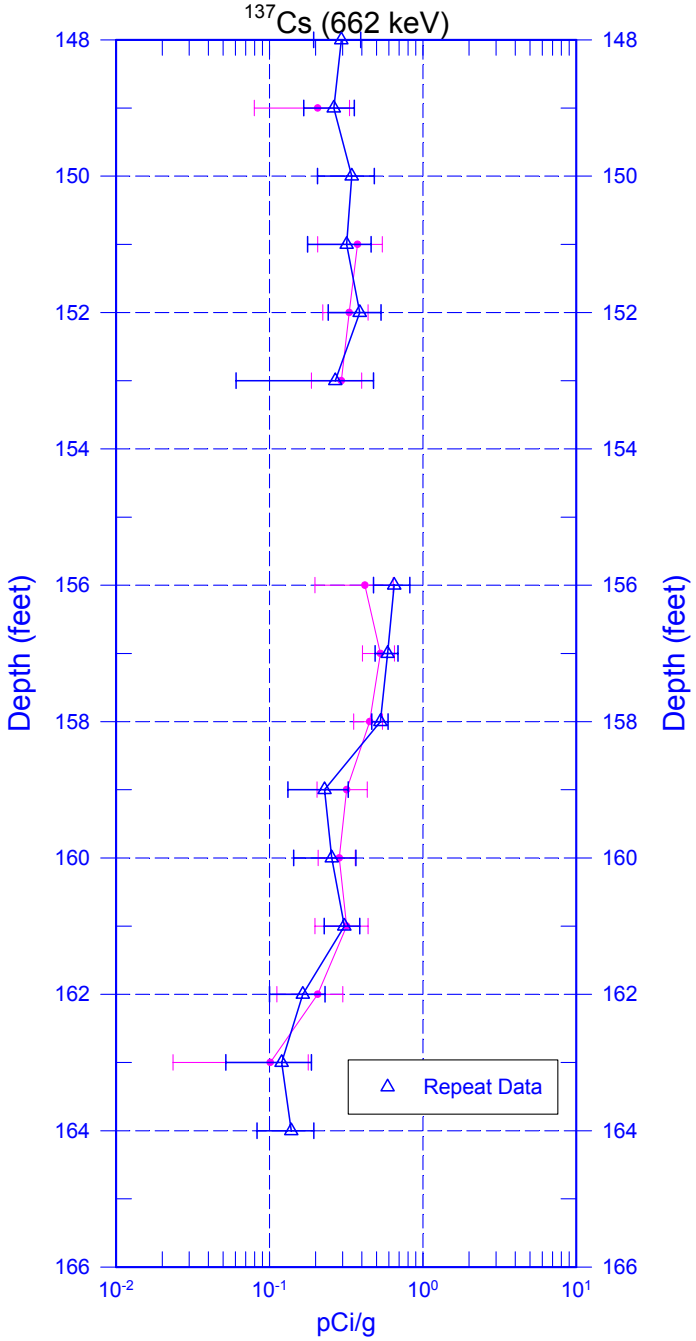
299-W15-64 (A7365)
Total Gamma



Zero Reference = Top of Casing

Last Logging Date - 07/21/04

299-W15-64 (A7365)
Manmade Repeat Section

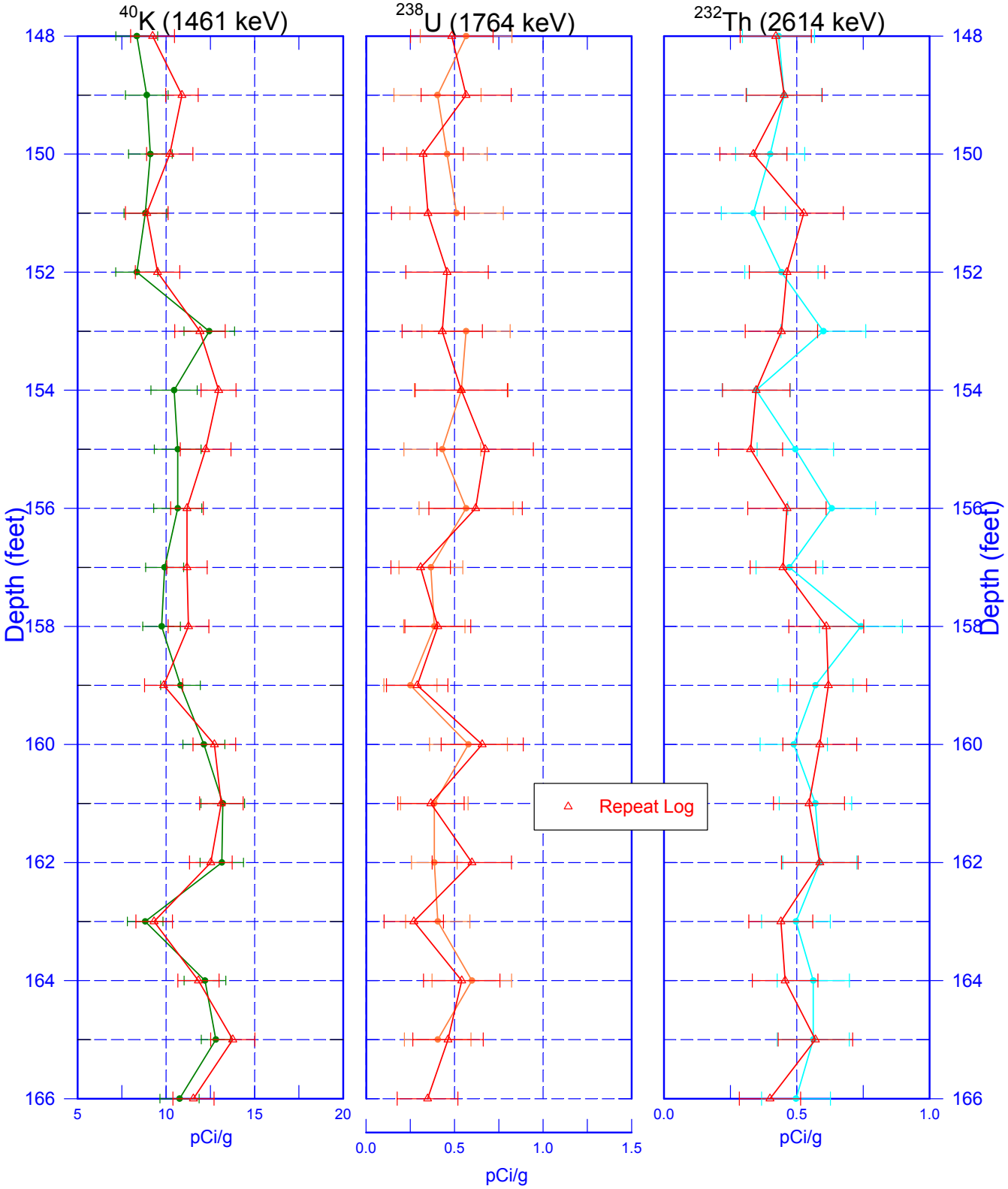


Zero Reference = Top of Casing

Last Log Date - 07/21/04

299-W15-64 (A7365)

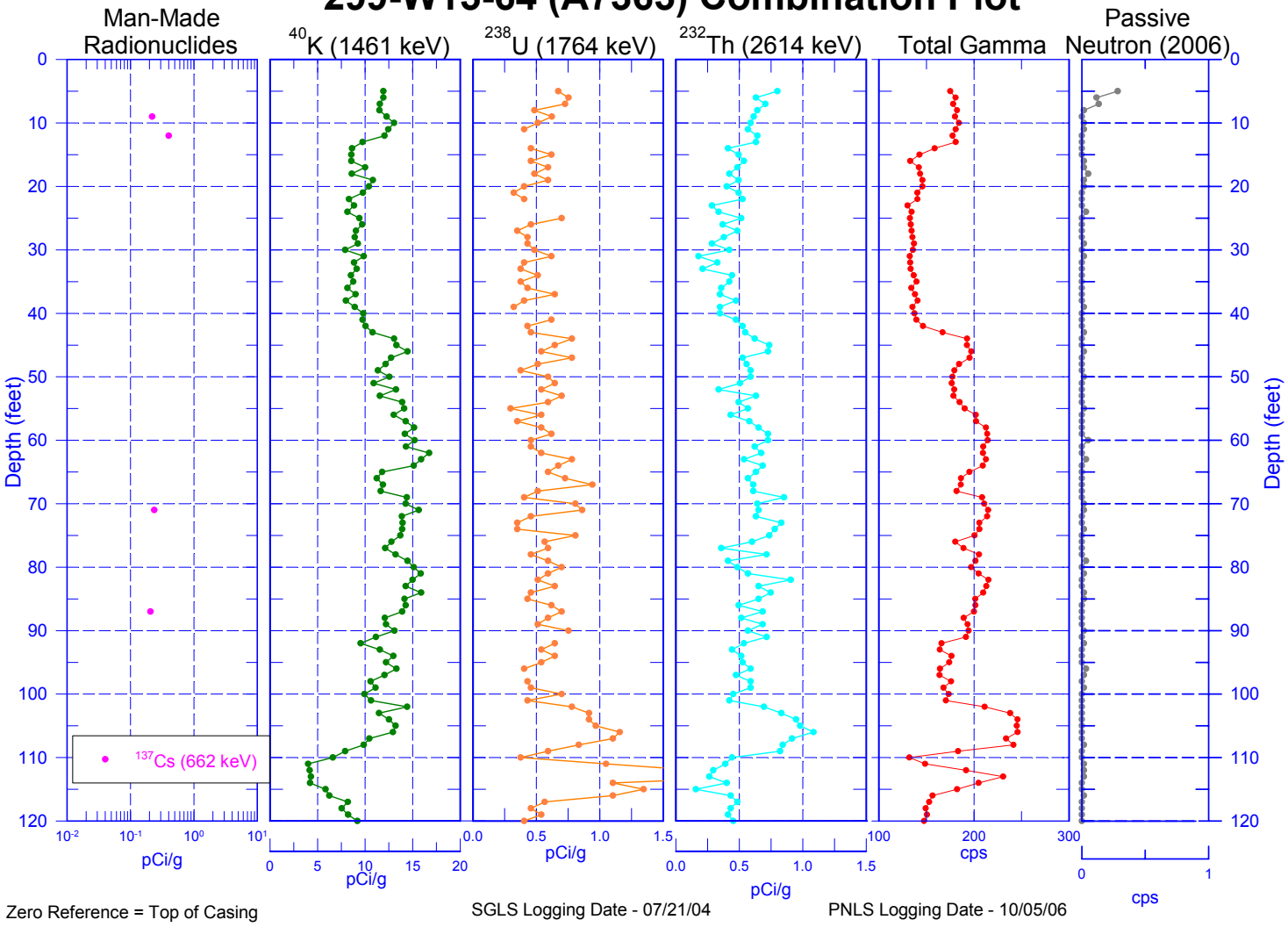
Repeat Section of Natural Gamma Logs



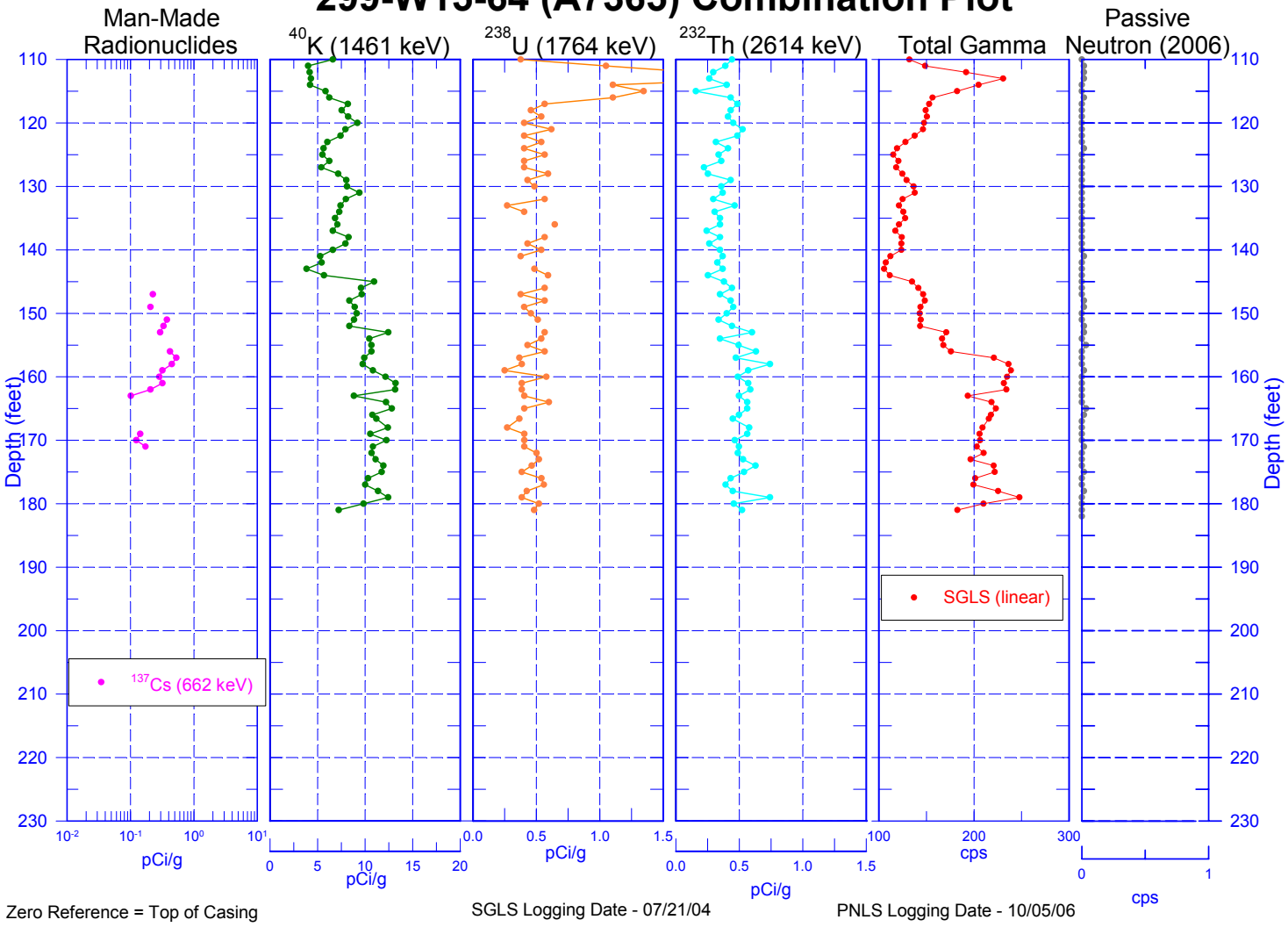
Zero Reference = Top of Casing

Last Log Date - 07/21/04

299-W15-64 (A7365) Combination Plot



299-W15-64 (A7365) Combination Plot



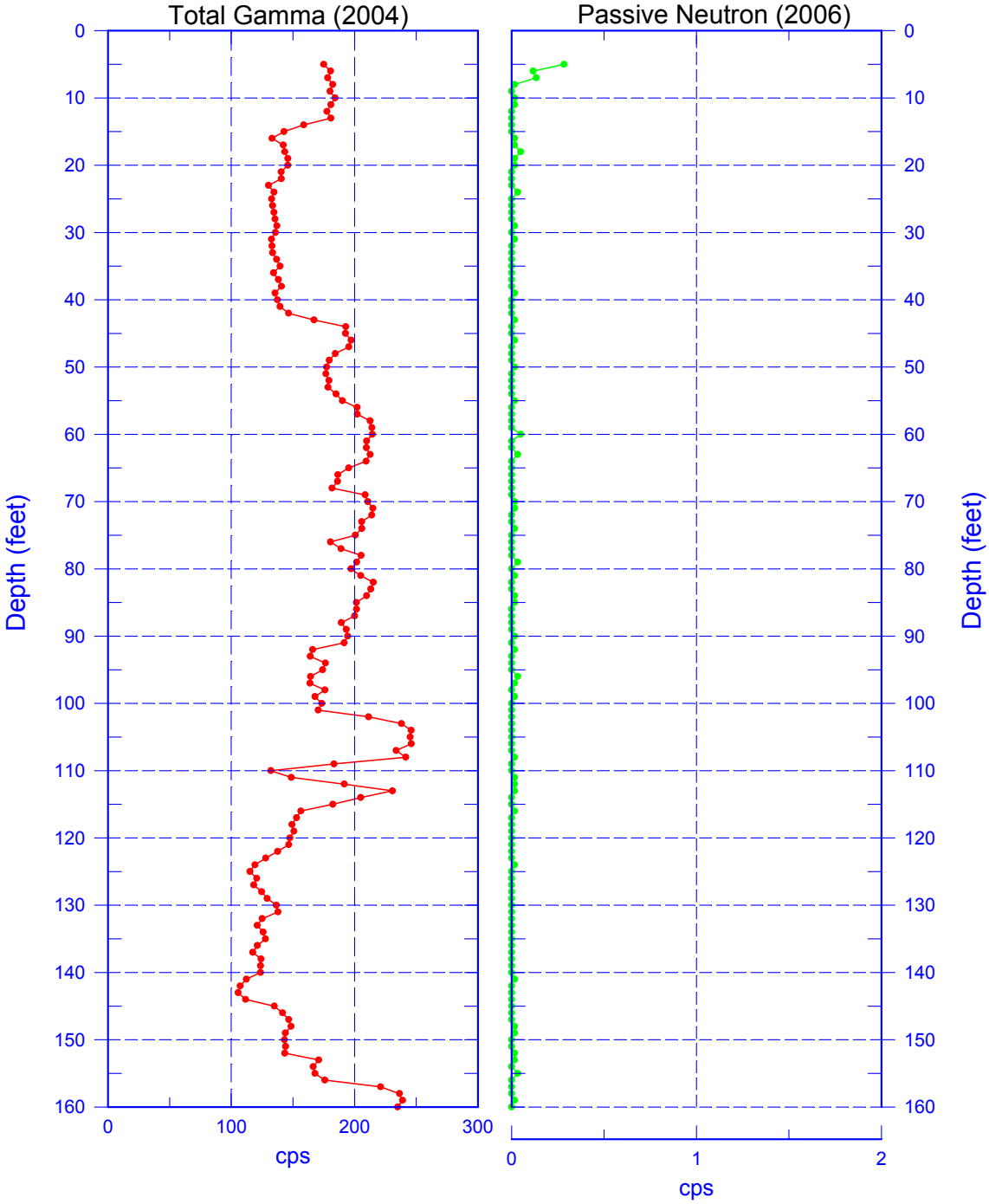
Zero Reference = Top of Casing

SGLS Logging Date - 07/21/04

PNLS Logging Date - 10/05/06

299-W15-64 (A7365)

Total Gamma & Passive Neutron

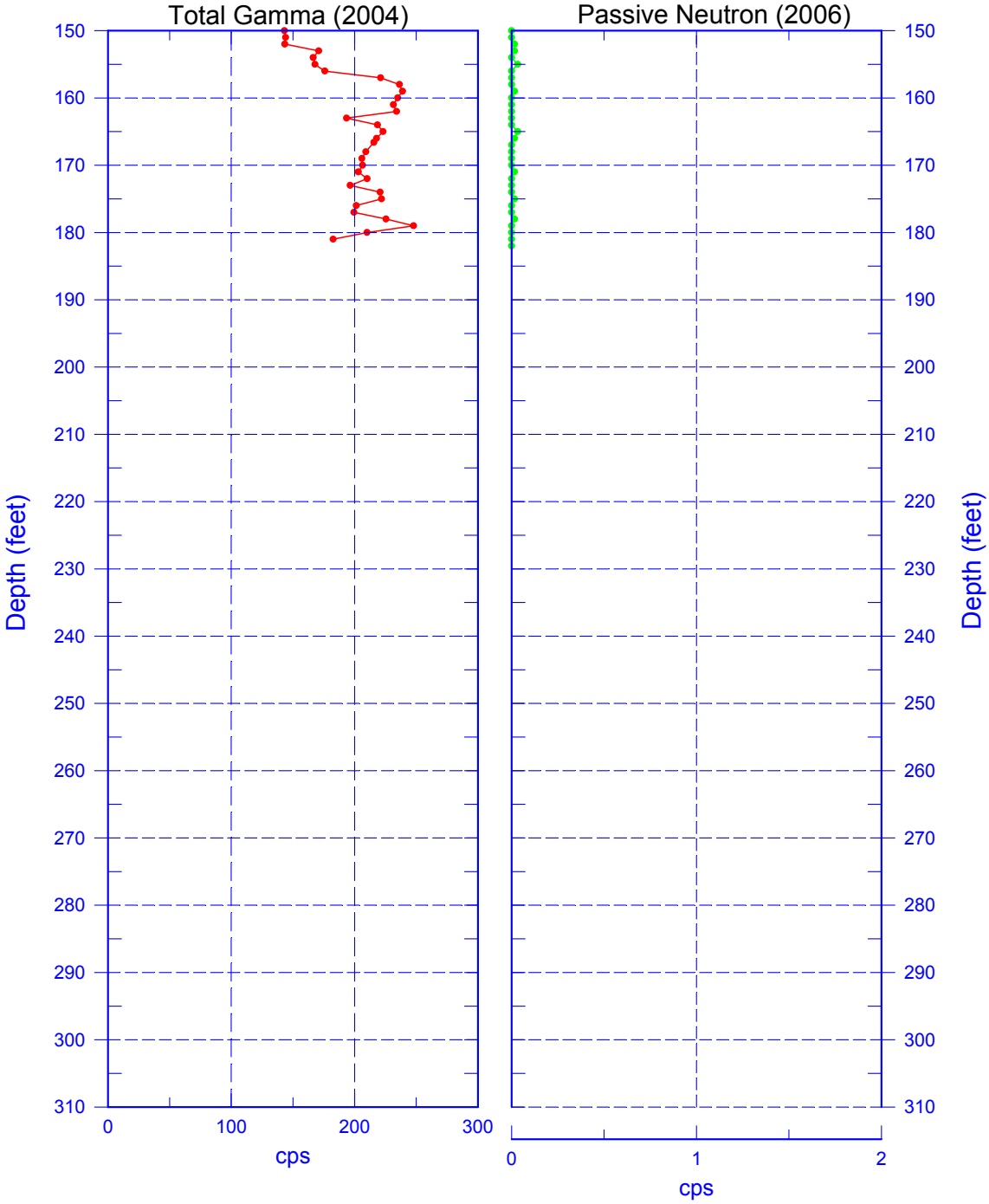


Zero Reference = Top of Casing

Last Logging Date - 10/05/06

299-W15-64 (A7365)

Total Gamma & Passive Neutron



Zero Reference = Top of Casing

Last Logging Date - 10/05/06